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Date: June 11, 2009

Patent 0-05-109 - 15408/US/02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Bar-Yaakov et al.
Serial no.:	10/541,668
371(c) date:	December 27, 2005
I.A. Filed:	January 12, 2004
Title:	FLAME RETARDANT FOR ENGINEERING THERMOPLASTIC APPLICATIONS
Examiner:	Megan MCCULLEY
Art Unit:	1796
Confirmation:	4122

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

Response and Amendment

This response is being submitted in reply to the office action mailed on March 13, 2009.

Amendments

The ambiguous parentheses in claims 4, 6 and 22 have been removed to comply with the Examiner's request. Claims 1, 10, and 22 have been amended for the sake of clarity.

Claim Rejections – 35 USC §112

The Examiner rejects claims 4, 6 and 22 as being indefinite for failing to point out the subject matter of the invention.

It is believed that the amendment effected in claims 4, 6 and 22, render the Examiner's objection moot.

Claim Rejections – 35 USC §102

The Examiner rejects claims 1, 3, 4, 6-9, 10 and 21 as being anticipated by Nantaku et al. (JP 2001-310990). The Applicant respectfully traverses the Examiner's objection. Citations to the Japanese document refer to the English translation of the document.

The Applicant notes that the technical problem solved by Nantaku et al. is to provide a flame retardant polyester resin composition presenting particular flame retardancy and mechanical characteristics, being stable to heating temperature during molding, generating little halogen gas and being recyclable without deterioration of the aforementioned characteristics (see abstract). Nantaku et al. mention that free tribromophenol combined to residual catalyst from the flame retardant composition may

generate a corrosive gas (see [0005]). Therefore, another objective of Nantaku et al. is to minimize the corrosive effects by producing flame retardant compositions having a phenolic acid number below 1.0 mg KOH/g (see [0007], line 17). However, Nantaku et al. neither mention nor suggest minimizing corrosion and failure of metallic parts due to the flame-retarded polymeric compositions by reducing the content of organic solvent. On the other hand, the flame retardant of the present invention has not only an acid number below 1 mg KOH/g, but also an amount of organic solvents, with boiling point lower than 250°C, lower than 100 ppm of the whole flame retardant, which further reduces corrosive effects (see for instance page 13, lines 13-18 of the present application).

The Examiner mentioned, on page 3, lines 13-14, of the present Office Action that Nantaku et al. show examples in which the solvent has been removed (page 7, [0030] and [0031]). However, it is known in the art that it is very difficult to reduce the content of organic solvent to very low levels in high molecular weight brominated epoxides (see application as filed, page 2 lines 33-35 and page 3 lines 1-10), in particular when a considerable amount of solvent is used both for the chemical reaction and the cleaning steps (see Nantaku et al., page 7, [0030], lines 4-6, wherein a total amount of 2600g of dioxane is used in the process). Moreover, the Applicant directs the Examiner's attention to Examples 1 and 3 of the present application which clearly support this observation. The flame retardant of Example 1, prepared without solvent, has a volatile content of 13 ppm (see page 7, line 15). In comparison, the flame retardant of Example 3, prepared in a reaction mixture comprising 100g dioxane, has a volatile content of more than 74,300 ppm (see table page 8).

Removal of the solvent in Example 3 of the application was performed as disclosed in Nantaku et al., i.e., with a heating vacuum dryer. As a result of 25h cumulative treatment, the volatile content was only reduced to 1900 ppm, which is almost 20 times more than in the flame retardant of the present invention. Therefore, in view of the difficulty to reduce the content in organic solvent in high molecular weight brominated epoxides, an average person skilled in the art would know that reaching a value of 100 ppm of organic solvent by heat vacuum drying, when using a considerable amount of solvent, would not be achievable in a reasonable amount of time and at reasonable costs. Nantaku et al. do not teach nor suggest that their compositions contain less than 100 ppm of organic solvent, and in view of the above, it can be reasonably believed that these compositions do contain more than 100 ppm of organic solvent with boiling point lower than 250°C.

In view of the above, the Applicant respectfully submits that claim 1, as well as all the claims dependent therefrom, are novel and inventive over Nantaku et al. For the same reason, independent claim 10 and dependent claim 21, both directed to compositions comprising a fire retardant of the invention, are novel and inventive over Nantaku et al.

Claim Rejections – 35 USC §103

The Examiner rejects claims 1-3, 6-9 as being unpatentable over Nakai et al. (US 5,250,590) in view of Nantaku et al. (JP 2001-310990). The Applicant respectfully traverses the Examiner's objection. Citations of the Japanese document refer to the English translation of the document.

Nakai et al. relate to a flame retardant resin composition comprising 10 to 70% by weight of a rubber-reinforced styrene base resin, 20 to 85% by weight of a polycarbonate

resin, 5 to 35% of a high molecular weight halogen-containing compound and 0 to 10% by weight of an antimony compounds. The high molecular weight halogen-containing compound has an average polymerization degree of 4 to 30, a bromine content of at least 45% by weight and an epoxy equivalent of at least 10,000 g/mol.

Nantaku et al. relate to a flame retardant polyester resin composition presenting particular flame retardancy and mechanical characteristics, being stable to heating temperature during molding, generating little halogen gas and being recyclable without deterioration of the aforementioned characteristics.

However neither Nakai et al. nor Nantaku et al. specify that their flame retardant should have an amount of organic solvents, with boiling point lower than 250°C, lower than 100 ppm of the whole flame retardant.

As noted by the Examiner, Nakai et al. mentions a fire retardant close to the one of the present invention (Table 1, Example 3), prepared in a reaction mixture which does not contain a solvent (col. 4, lines 61-68). However, an average person skilled in the art would understand that the absence of solvent in the reaction mixture is not the sole condition to obtain an amount of organic solvent lower than 100 ppm in the final flame retardant.

To illustrate the above point, the Applicant respectfully draws the Examiner's attention to Example 1 and Example 2 of the present application. Two flame retardants, respectively F-3100 LG and F-3100 R, were prepared in a reaction mixture which does not contain a solvent. However the former one has a volatile content of only 13 ppm, which satisfies the condition aforementioned, whereas the latter has a volatile content of 290 ppm. This difference is due to the difference in purity of the reagent used, especially the bromobisphenol A type epoxy resin, of which content of organic solvent may vary significantly.

The limitation in the amount of organic solvent is crucial as it can be seen in Example 7: a polymeric composition comprising F-3100 LG (13ppm of organic solvent) shows an improved corrosion resistance if compared to a polymeric composition comprising F-3100 R (290 ppm of organic solvent).

The flame retardant of the present invention guarantees an amount of organic solvent below 100 ppm by avoiding the use of a solvent in the production process and by using low molecular weight brominated epoxy resin containing below 100 ppm of organic solvent; this latter limitation is neither disclosed by Nakai et al. nor by Nantaku et al. Therefore, there is no evidence that the flame retardants of Nakai et al. or Nantaku et al. do contain below 100 ppm of organic solvent.

Moreover, it is respectfully submitted that the trained person in the art would not have deliberately used low molecular weight brominated epoxy resins having below 100 ppm of organic solvent, in a reaction mixture that do not contain a solvent, without the benefits of hindsight.

Therefore, it is believed that claims 1-3, and 6-9 are novel and non-obvious in view of Nakai et al. (US 5,250,590) and Nantaku et al. (JP 2001-310990), either alone or in combination.

The Examiner further rejects claim 20 as being unpatentable over Nantaku et al. (JP 2001-310990) as applied to claim 10 and in view of Chisholm et al. (US 2001/0009944). The Applicant respectfully traverses the Examiner's objection. Citations to the Japanese document refer to the English translation of the document.

As explained above, it is respectfully submitted that claim 10 is novel and inventive over Nantaku et al, as Nantaku et al. do not disclose compositions comprising a flame-retardant having an amount of organic solvents, with boiling point lower than 250°C, lower than 100 ppm of the whole flame retardant. Therefore, claim 20, which is dependent from claim 10 is also novel and inventive.

The Examiner also rejects claim 22 as being unpatentable over Nakai et al. (US 5,250,590) in view of Nantaku et al. (JP 2001-310990). The Applicant respectfully traverses the Examiner's objection. Citations to the Japanese document refer to the English translation of the document.

As explained above, the instant invention provides a process for the preparation of flame retardants for polymeric compositions, which comprises a step of reacting low molecular weight brominated epoxide LMW BE, having a molecular weight of between 650 and 3,500 Daltons, and having a content of organic solvents, with boiling point lower than 250°C, lower than 100ppm of the LMW BE, with tetrabromobisphenol-A (TBBA), and with a component selected from tribromophenol (TBP), tribromophenylglycidyl ether or a mixture thereof, in the presence of a catalyst, wherein said reaction takes place without addition of any solvent at a temperature of 100 to 250°C.

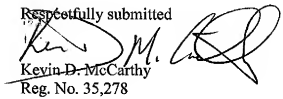
None of the cited publications, either taken alone or in combination, teach or even suggests using low molecular weight brominated epoxide LMW BE having a content of organic solvents, with boiling point lower than 250°C, lower than 100ppm of the LMW BE. As shown in Examples 1, 2 and 7 of the present application, this is an important feature of the present invention which helps minimizing corrosion of surrounding metallic parts.

Therefore, it is believed that claim 22 is novel and non-obvious in view of the cited publications.

Conclusion

Following the above explanations and the effected amendments, it is the Applicant's belief that the invention, as described in the amended claims, is novel and non-obvious over all the cited documents, and that the amended claims are ready for allowance.

Respectfully submitted



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